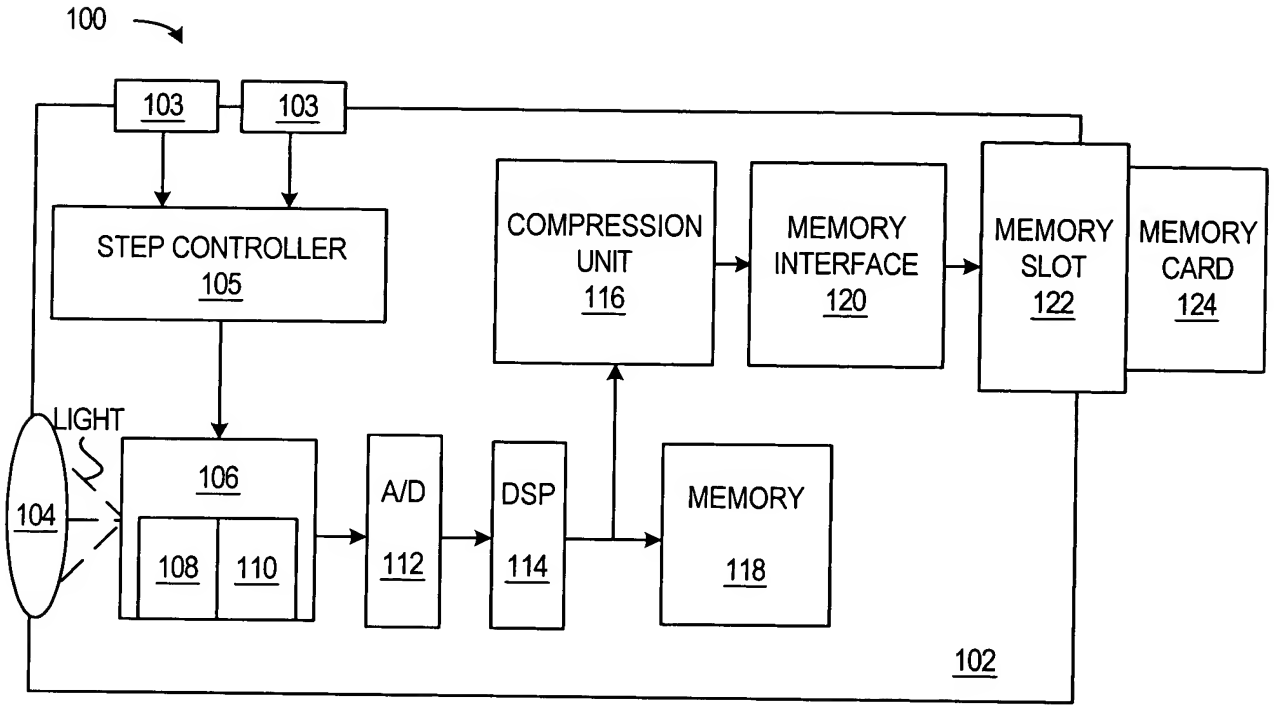

Figure 1
(Related Art)

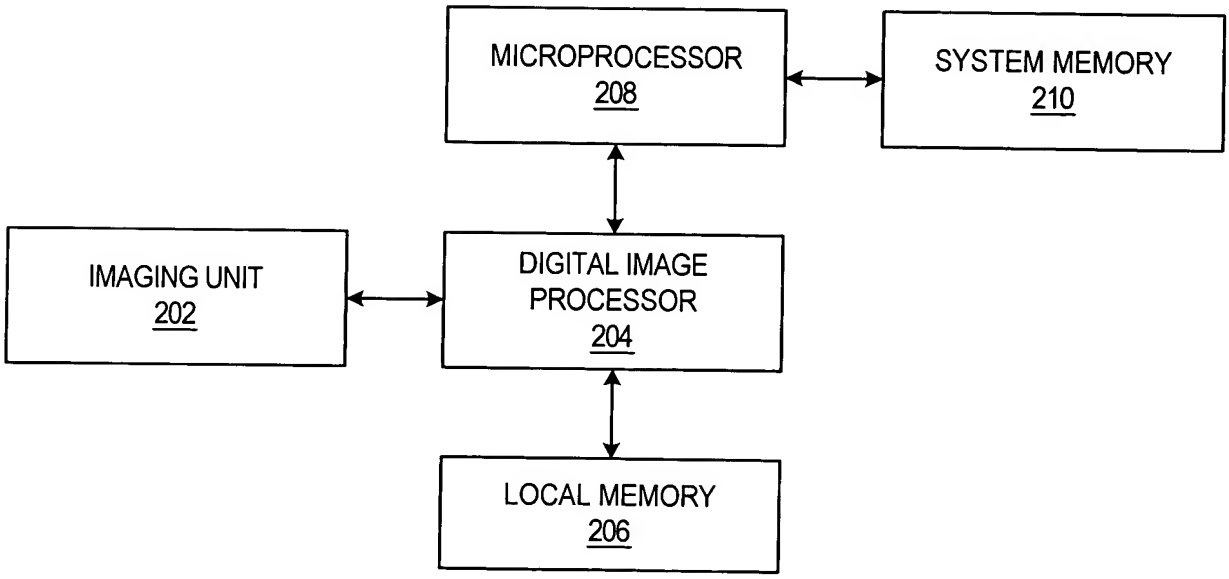

Figure 2A

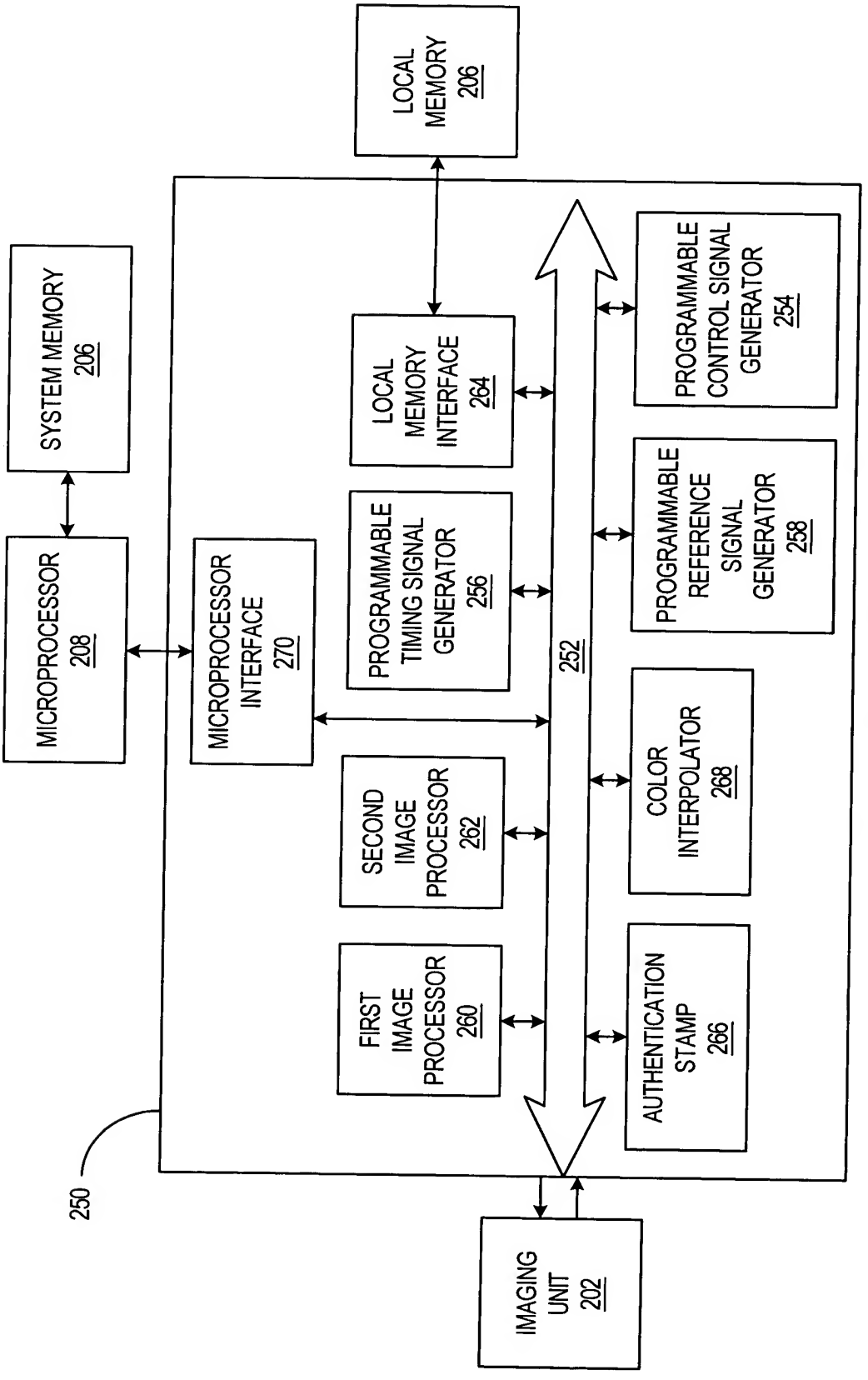
LOCAL MEMORY 206
SYSTEM MEMORY 206
MICROPROCESSOR 208
MICROPROCESSOR INTERFACE 270
LOCAL MEMORY INTERFACE 264
PROGRAMMABLE TIMING SIGNAL GENERATOR 256
SECOND IMAGE PROCESSOR 262
FIRST IMAGE PROCESSOR 260
252
PROGRAMMABLE CONTROL SIGNAL GENERATOR 254
PROGRAMMABLE REFERENCE SIGNAL GENERATOR 258
COLOR INTERPOLATOR 268
AUTHENTICATION STAMP 266
250
IMAGING UNIT 202

Figure 2B

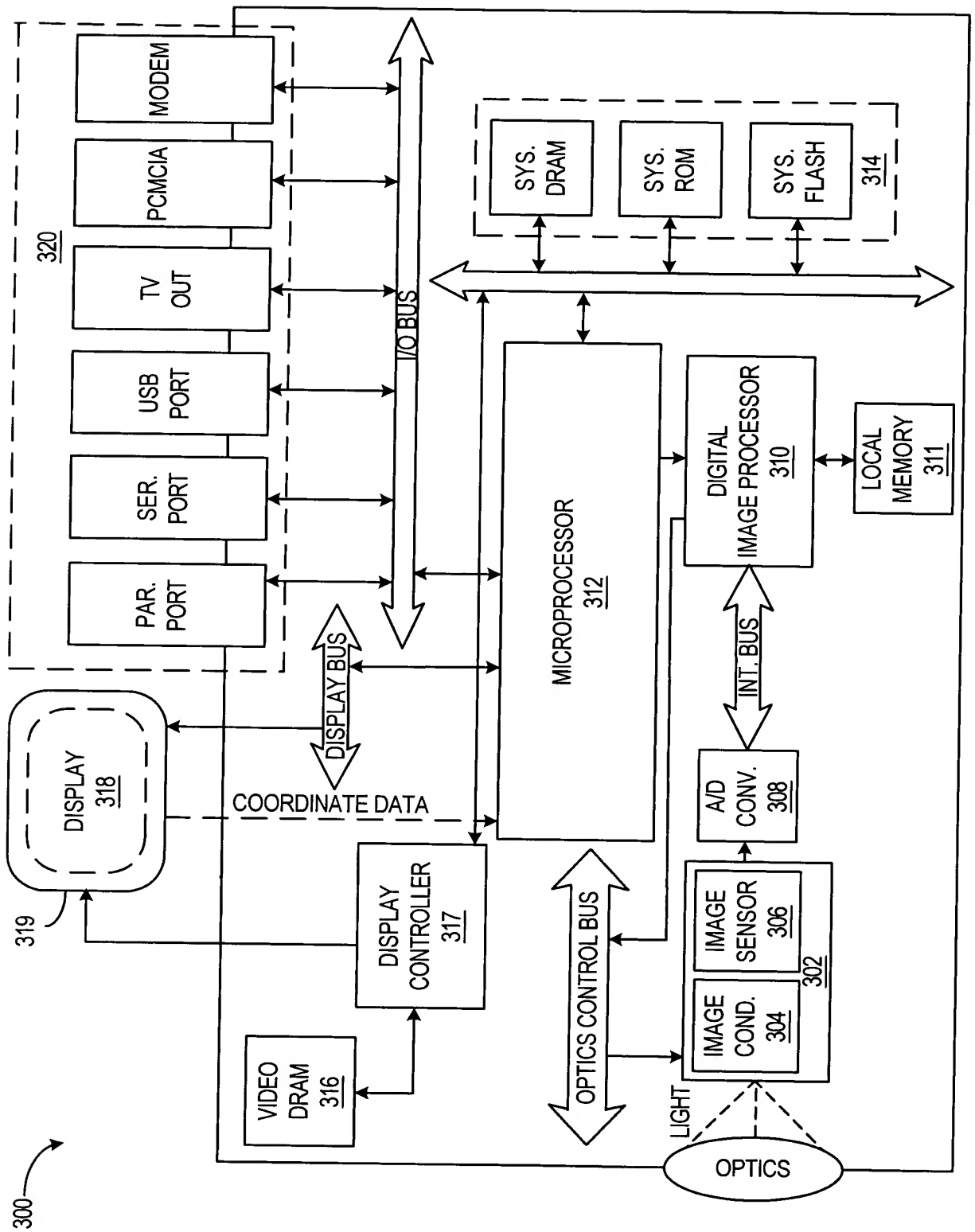
MODEM
PCMCIA
TV OUT
USB PORT
SER. PORT
PAR. PORT
320
I/O BUS
SYS. DRAM
SYS. ROM
SYS. FLASH
314
MICROPROCESSOR 312
DIGITAL IMAGE PROCESSOR 310
LOCAL MEMORY 311
INT. BUS
A/D CONV. 308
DISPLAY BUS
DISPLAY 318
COORDINATE DATA
DISPLAY CONTROLLER 317
VIDEO DRAM 316
OPTICS CONTROL BUS
IMAGE SENSOR 306
IMAGE COND. 304
302
LIGHT
OPTICS
319
300

Figure 3

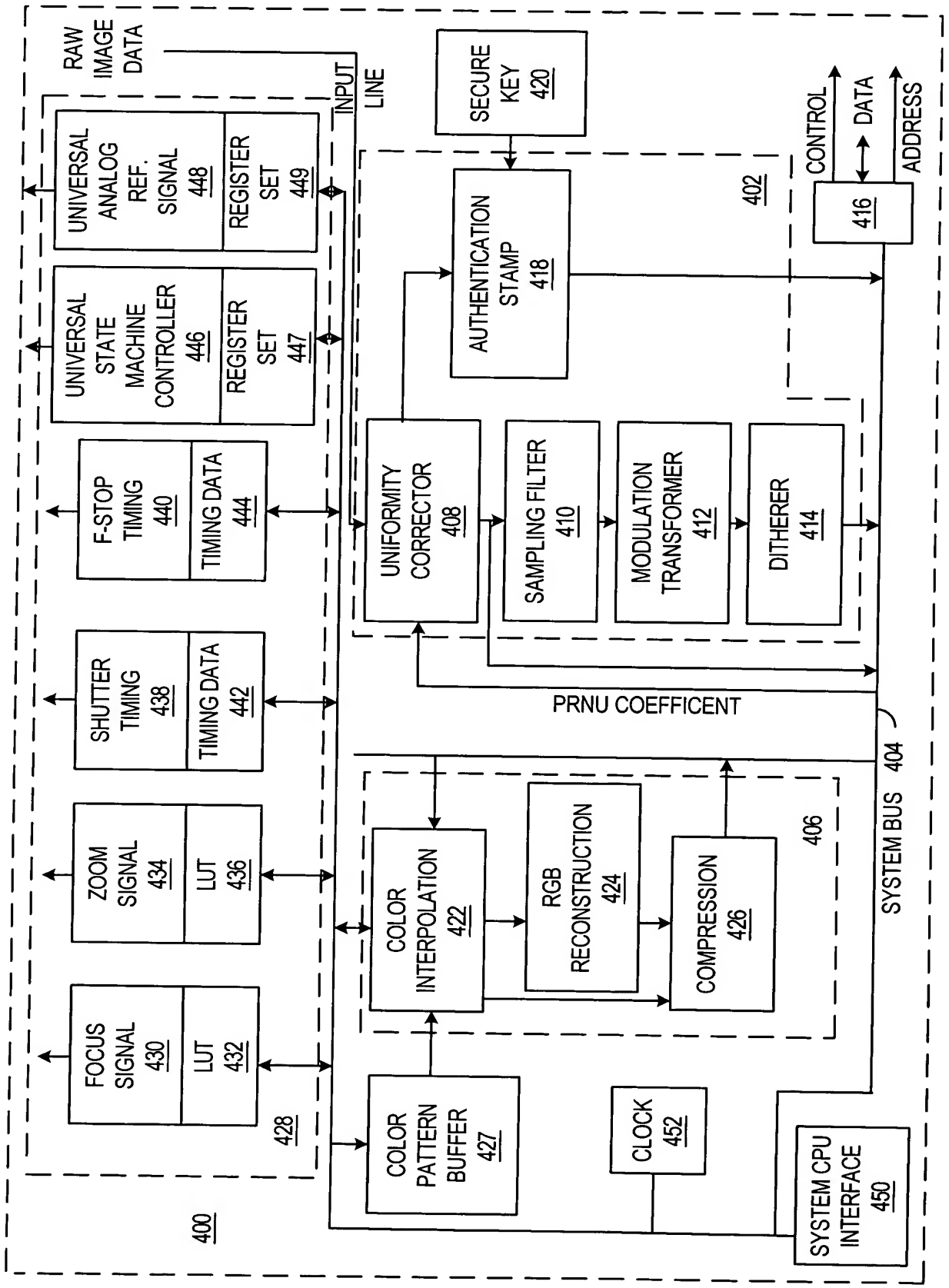
400
RAW IMAGE DATA
INPUT LINE
UNIVERSAL ANALOG REF. SIGNAL 448
REGISTER SET 449
UNIVERSAL STATE MACHINE CONTROLLER 446
REGISTER SET 447
F-STOP TIMING 440
TIMING DATA 444
SHUTTER TIMING 438
TIMING DATA 442
ZOOM SIGNAL 434
LUT 436
FOCUS SIGNAL 430
LUT 432
428
SECURE KEY 420
AUTHENTICATION STAMP 418
402
CONTROL
DATA
ADDRESS
416
UNIFORMITY CORRECTOR 408
SAMPLING FILTER 410
MODULATION TRANSFORMER 412
DITHERER 414
PRNU COEFFICENT
SYSTEM BUS 404
406
COLOR INTERPOLATION 422
RGB RECONSTRUCTION 424
COMPRESSION 426
COLOR PATTERN BUFFER 427
CLOCK 452
SYSTEM CPU INTERFACE 450

Figure 4

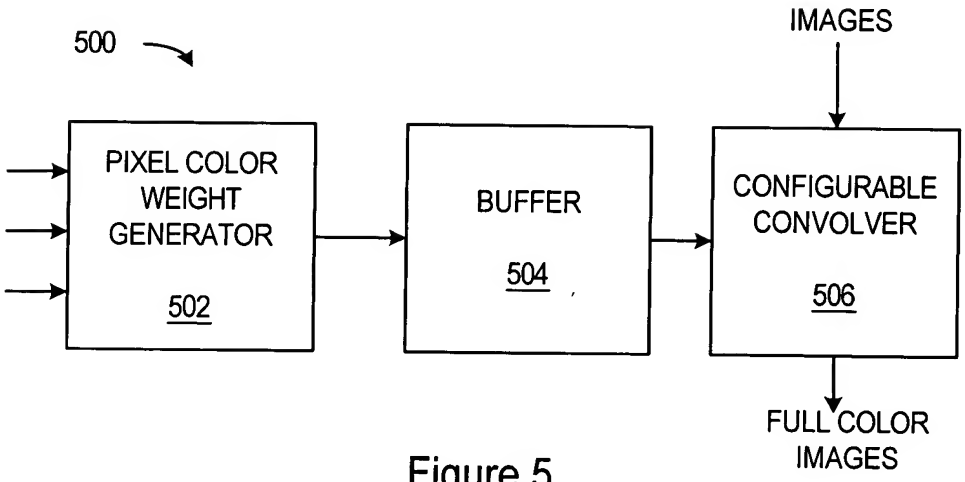

Figure 5

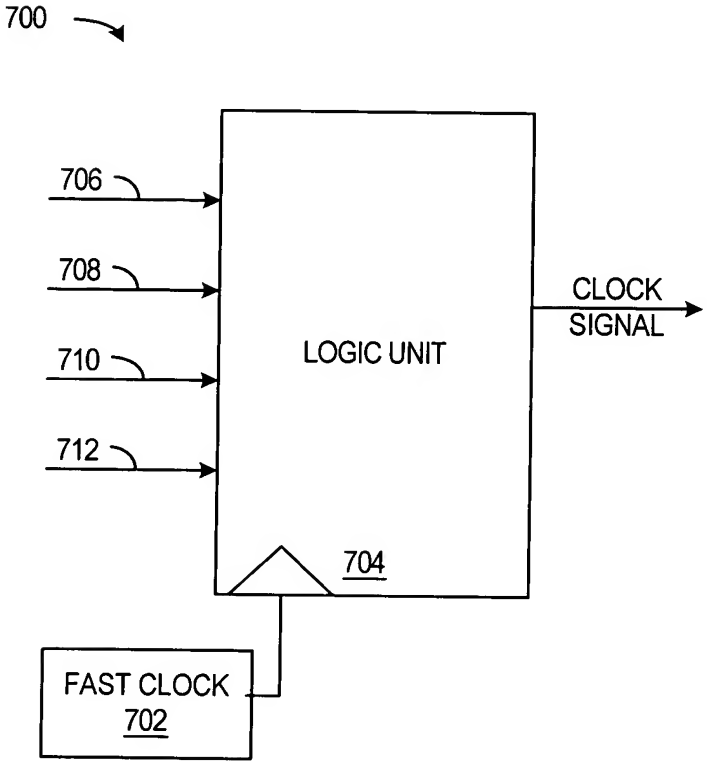

Figure 7

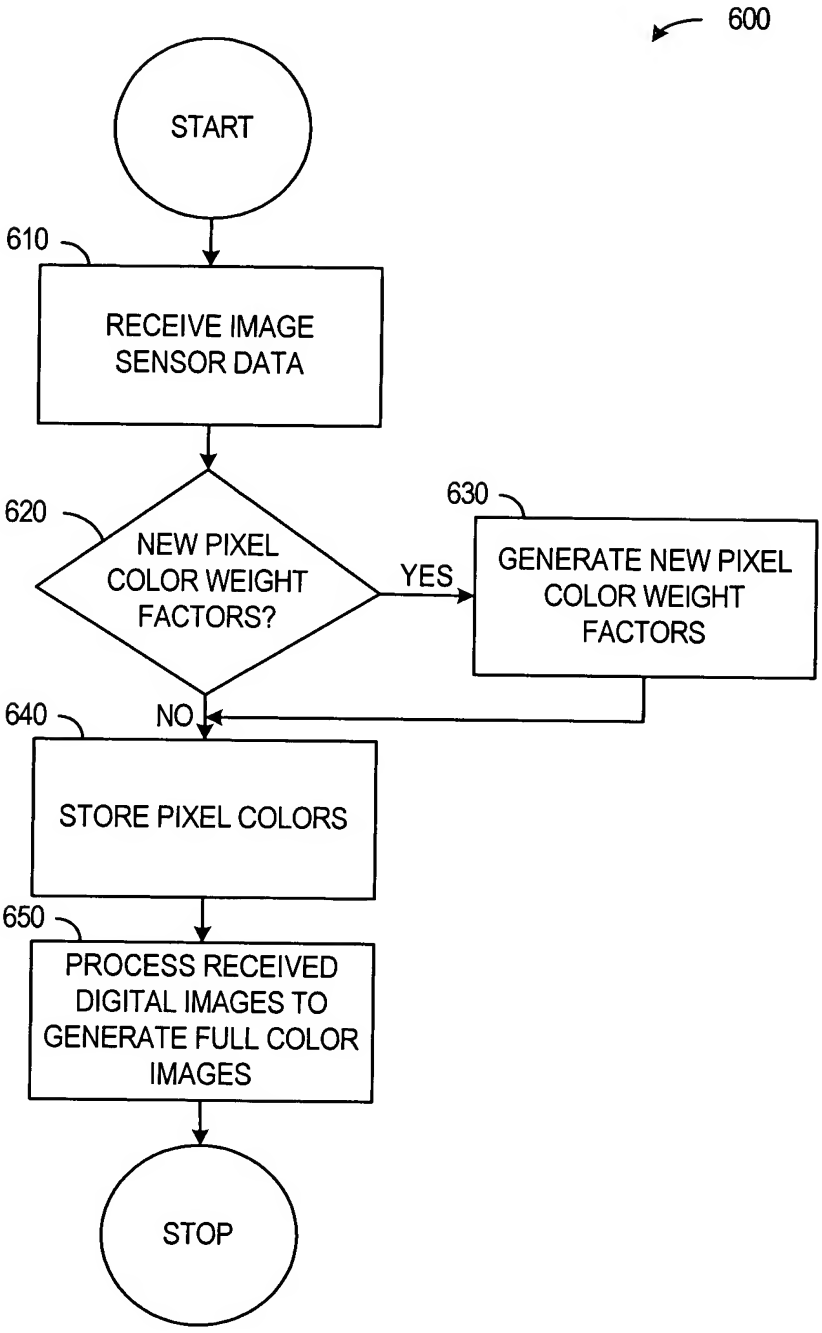
600
START
610
RECEIVE IMAGE SENSOR DATA
620
NEW PIXEL COLOR WEIGHT FACTORS?
YES
630
GENERATE NEW PIXEL COLOR WEIGHT FACTORS
NO
640
STORE PIXEL COLORS
650
PROCESS RECEIVED DIGITAL IMAGES TO GENERATE FULL COLOR IMAGES
STOP

Figure 6

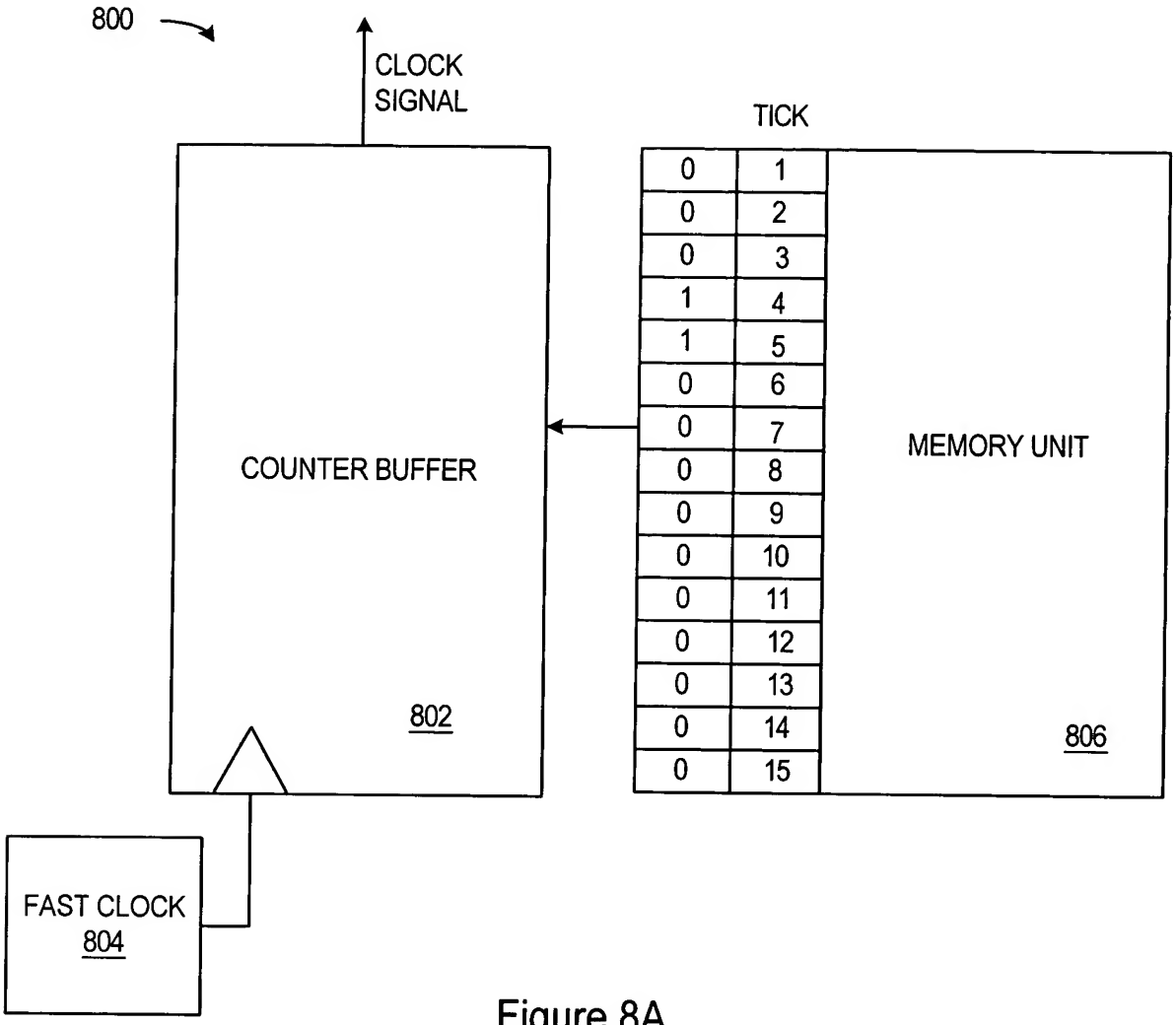

Figure 8A

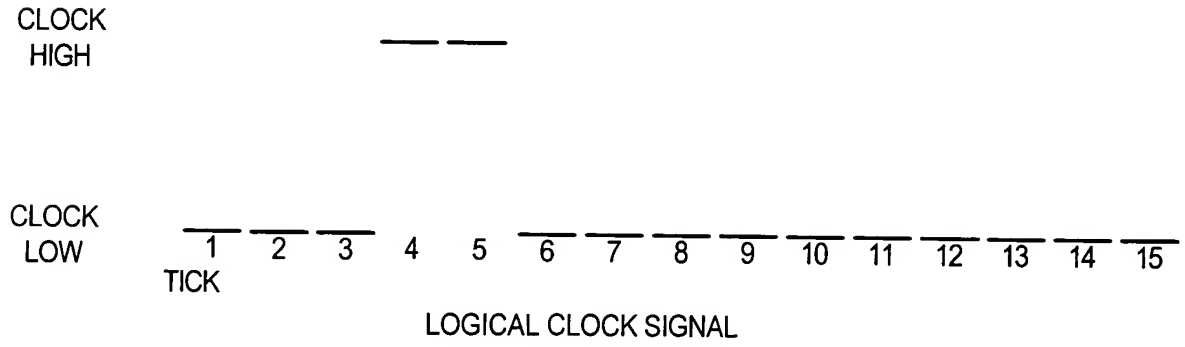

Figure 8B

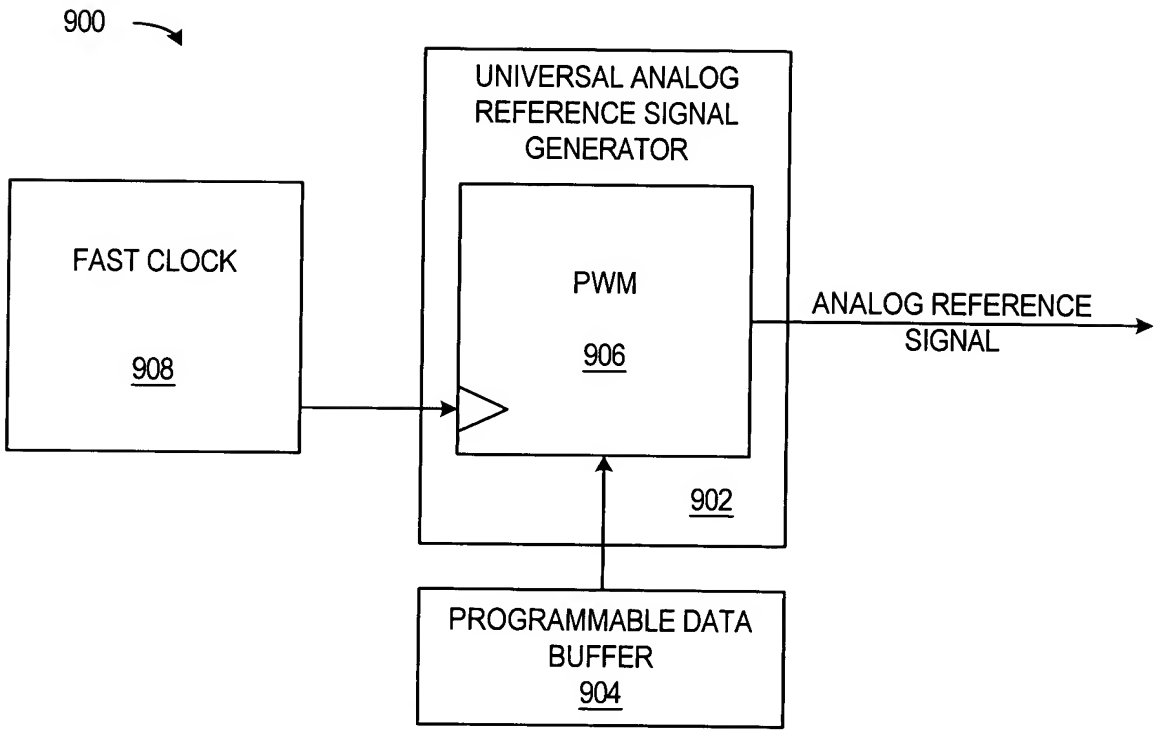
900
UNIVERSAL ANALOG REFERENCE SIGNAL GENERATOR
FAST CLOCK
908
PWM
906
ANALOG REFERENCE SIGNAL
902
PROGRAMMABLE DATA BUFFER
904

Figure 9

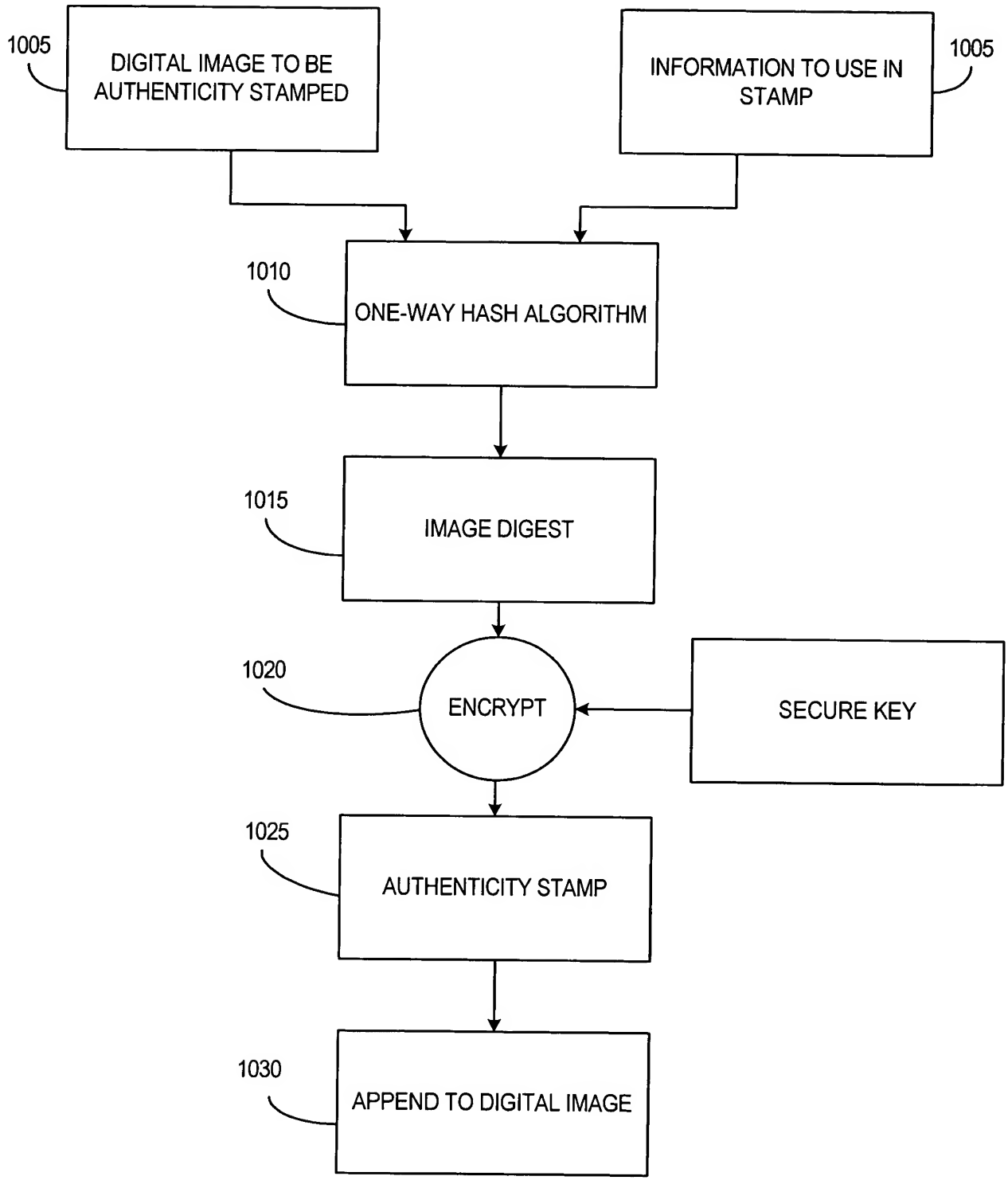
1005
DIGITAL IMAGE TO BE AUTHENTICITY STAMPED
INFORMATION TO USE IN STAMP
1005
1010
ONE-WAY HASH ALGORITHM
1015
IMAGE DIGEST
1020
ENCRYPT
SECURE KEY
1025
AUTHENTICITY STAMP
1030
APPEND TO DIGITAL IMAGE

Figure 10A

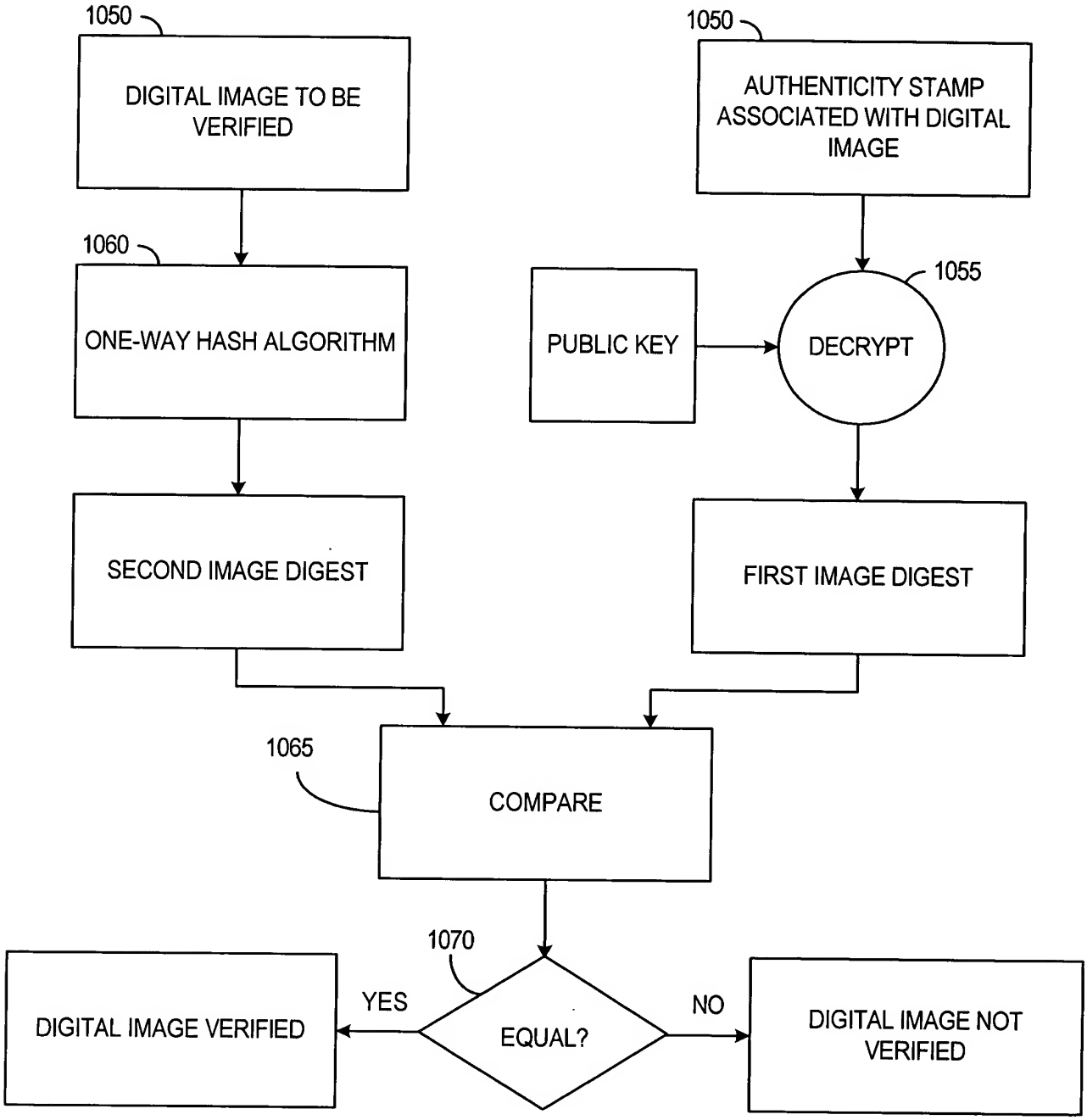
1050
DIGITAL IMAGE TO BE VERIFIED
1060
ONE-WAY HASH ALGORITHM
SECOND IMAGE DIGEST
1050
AUTHENTICITY STAMP ASSOCIATED WITH DIGITAL IMAGE
1055
PUBLIC KEY
DECRYPT
FIRST IMAGE DIGEST
1065
COMPARE
1070
EQUAL?
YES
DIGITAL IMAGE VERIFIED
NO
DIGITAL IMAGE NOT VERIFIED

Figure 10B

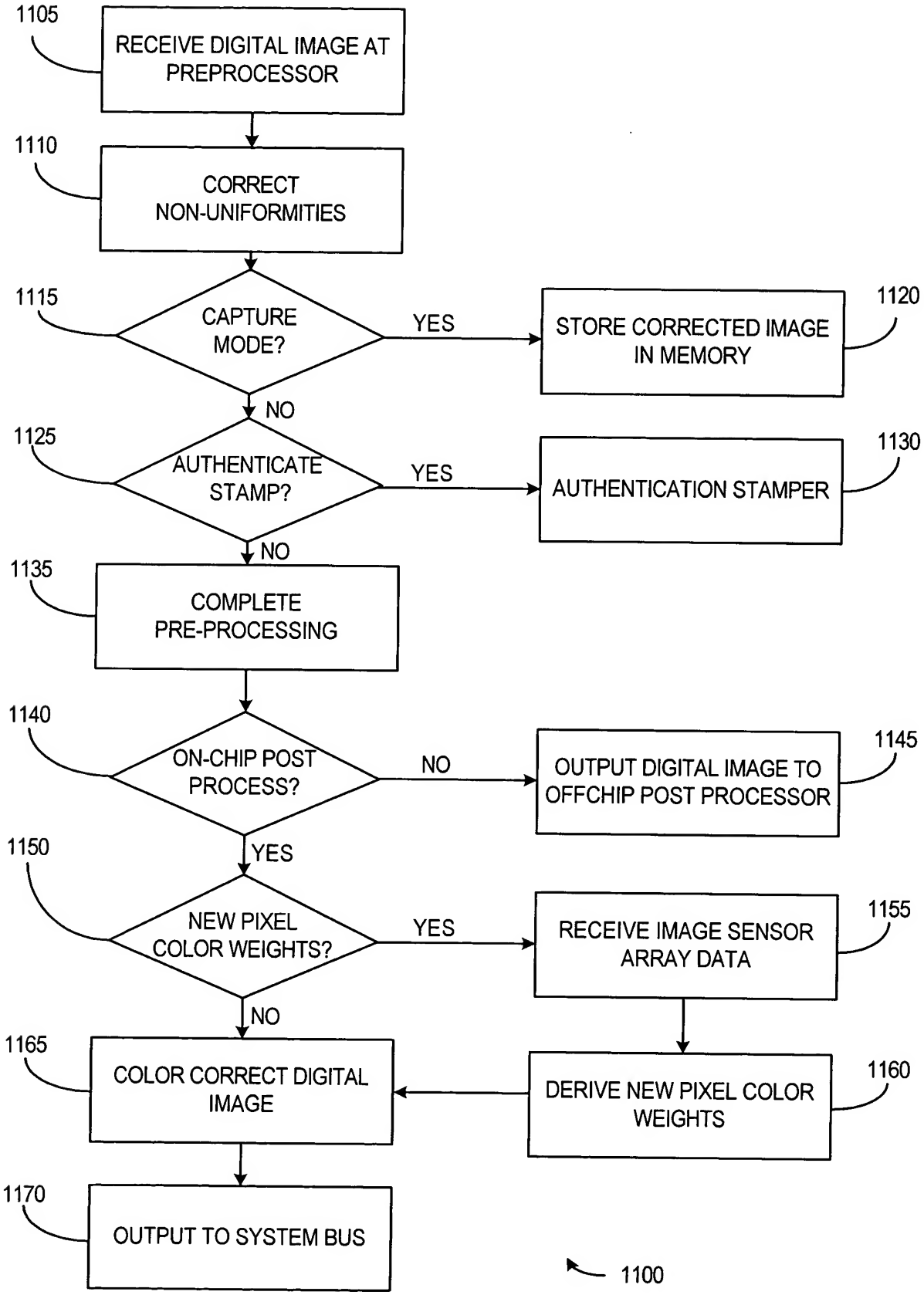
1105
RECEIVE DIGITAL IMAGE AT PREPROCESSOR
1110
CORRECT NON-UNIFORMITIES
1115
CAPTURE MODE?
YES
1120
STORE CORRECTED IMAGE IN MEMORY
NO
1125
AUTHENTICATE STAMP?
YES
1130
AUTHENTICATION STAMPER
NO
1135
COMPLETE PRE-PROCESSING
1140
ON-CHIP POST PROCESS?
NO
1145
OUTPUT DIGITAL IMAGE TO OFFCHIP POST PROCESSOR
YES
1150
NEW PIXEL COLOR WEIGHTS?
YES
1155
RECEIVE IMAGE SENSOR ARRAY DATA
NO
1165
COLOR CORRECT DIGITAL IMAGE
1160
DERIVE NEW PIXEL COLOR WEIGHTS
1170
OUTPUT TO SYSTEM BUS
1100

Figure 11

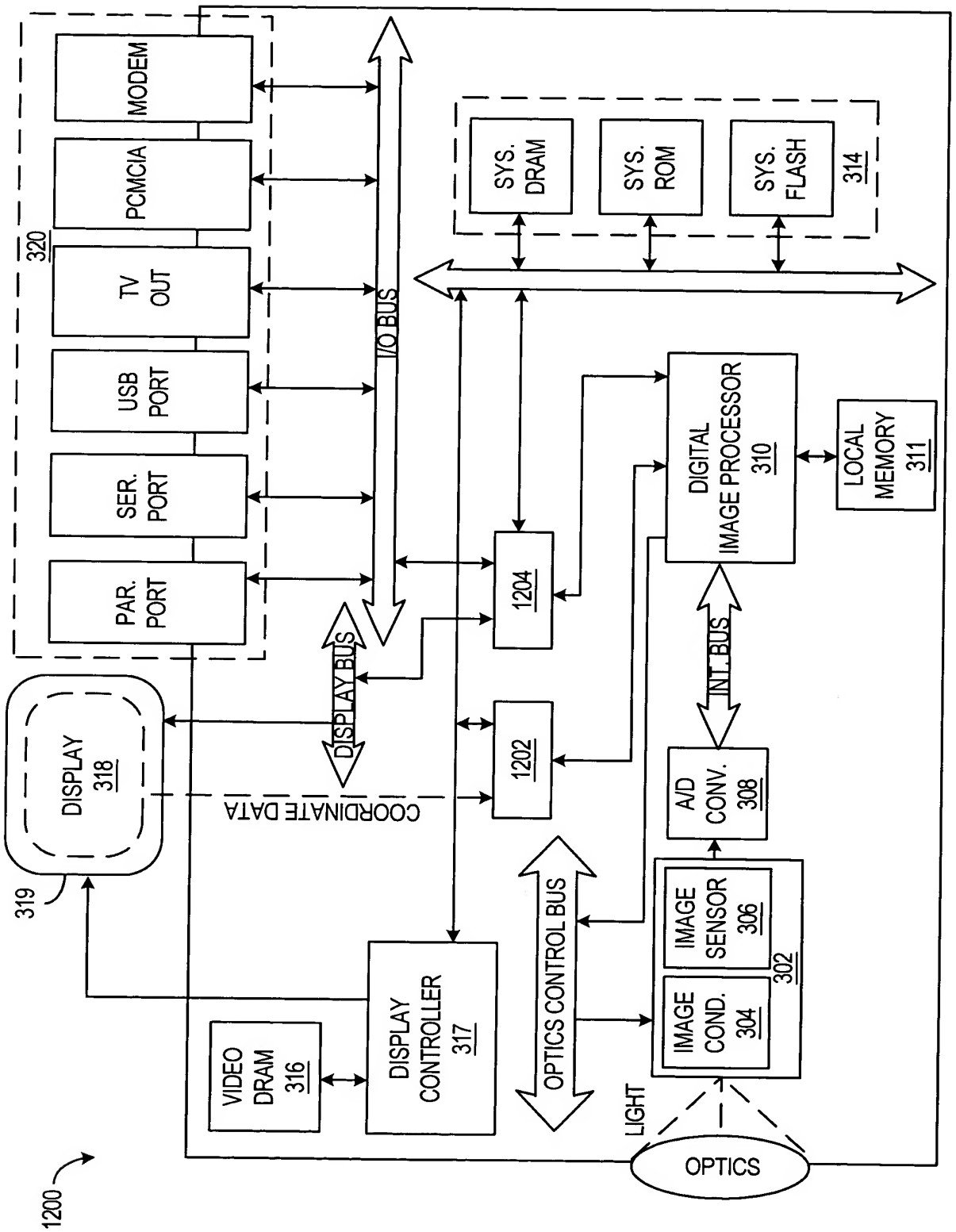
1200
320
MODEM
PCMCIA
TV OUT
USB PORT
SER. PORT
PAR. PORT
I/O BUS
SYS. DRAM
SYS. ROM
SYS. FLASH
314
DIGITAL IMAGE PROCESSOR 310
LOCAL MEMORY 311
1204
DISPLAY BUS
INT. BUS
DISPLAY 318
319
1202
COORDINATE DATA
A/D CONV. 308
IMAGE SENSOR 306
IMAGE COND. 304
302
OPTICS CONTROL BUS
VIDEO DRAM 316
DISPLAY CONTROLLER 317
LIGHT
OPTICS

Figure 12

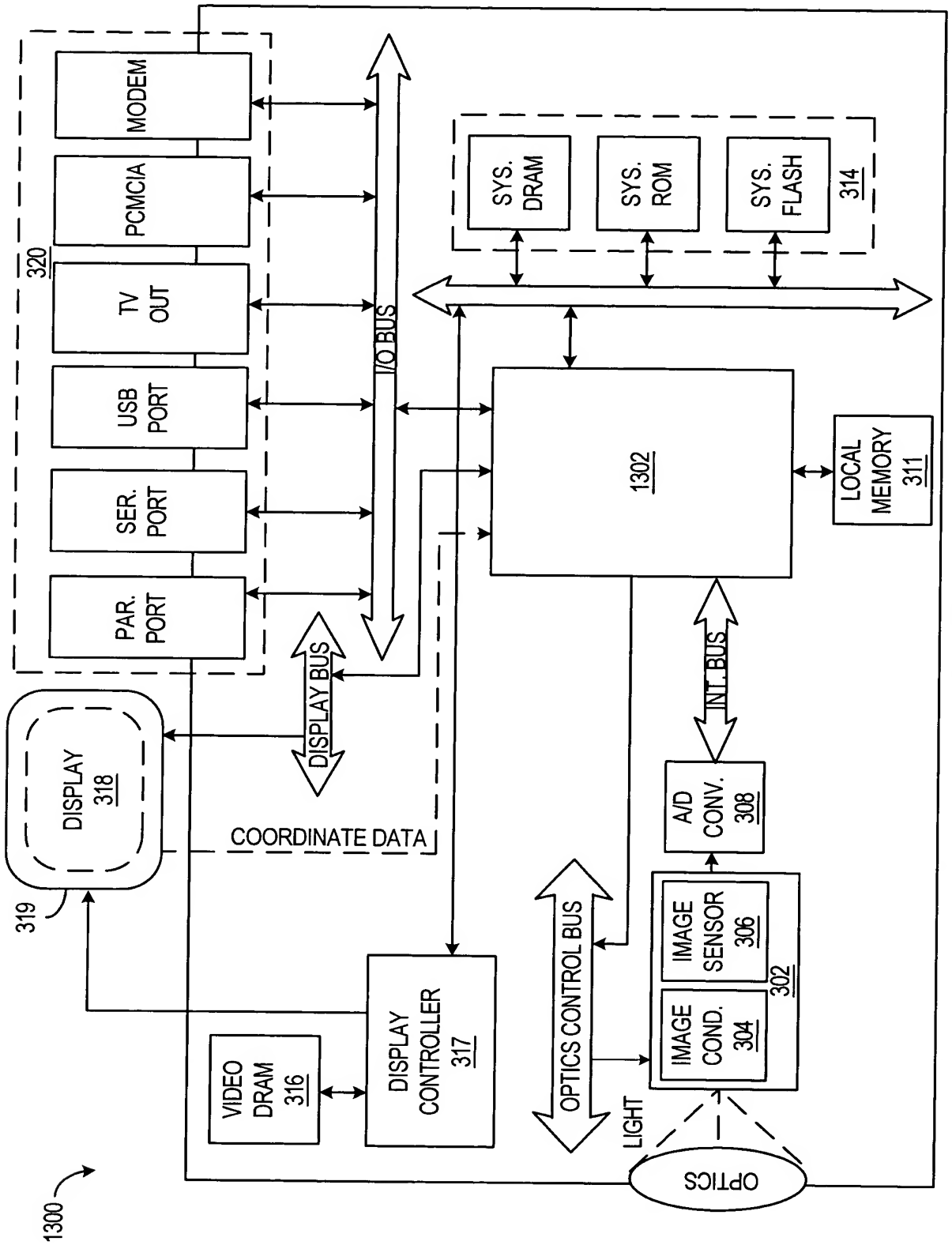
1300
MODEM
PCMCIA
TV OUT
USB PORT
SER. PORT
PAR. PORT
320
I/O BUS
SYS. DRAM
SYS. ROM
SYS. FLASH
314
1302
LOCAL MEMORY 311
DISPLAY BUS
INT. BUS
DISPLAY 318
319
COORDINATE DATA
A/D CONV. 308
IMAGE SENSOR 306
IMAGE COND. 304
302
OPTICS CONTROL BUS
LIGHT
OPTICS
VIDEO DRAM 316
DISPLAY CONTROLLER 317

Figure 13

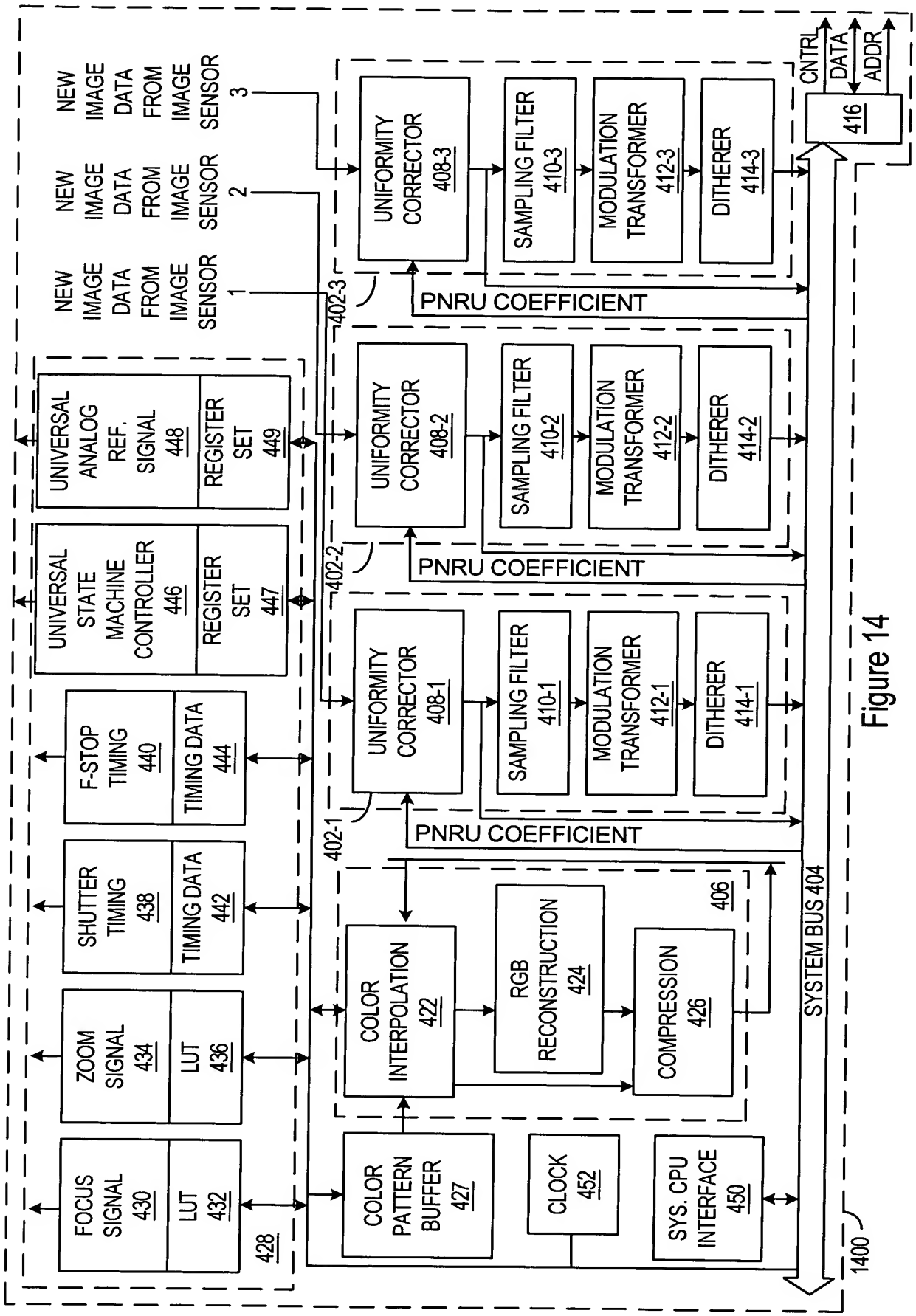
NEW IMAGE DATA FROM IMAGE SENSOR 1
NEW IMAGE DATA FROM IMAGE SENSOR 2
NEW IMAGE DATA FROM IMAGE SENSOR 3
UNIFORMITY CORRECTOR 408-3
SAMPLING FILTER 410-3
MODULATION TRANSFORMER 412-3
DITHERER 414-3
UNIFORMITY CORRECTOR 408-2
SAMPLING FILTER 410-2
MODULATION TRANSFORMER 412-2
DITHERER 414-2
UNIFORMITY CORRECTOR 408-1
SAMPLING FILTER 410-1
MODULATION TRANSFORMER 412-1
DITHERER 414-1
PNRU COEFFICIENT
PNRU COEFFICIENT
PNRU COEFFICIENT
402-3
402-2
402-1
CNTRL
DATA
ADDR
416
UNIVERSAL ANALOG REF. SIGNAL 448
REGISTER SET 449
UNIVERSAL STATE MACHINE CONTROLLER 446
REGISTER SET 447
F-STOP TIMING 440
TIMING DATA 444
SHUTTER TIMING 438
TIMING DATA 442
ZOOM SIGNAL 434
LUT 436
FOCUS SIGNAL 430
LUT 432
428
COLOR INTERPOLATION 422
RGB RECONSTRUCTION 424
COMPRESSION 426
406
COLOR PATTERN BUFFER 427
CLOCK 452
SYS. CPU INTERFACE 450
SYSTEM BUS 404
1400

Figure 14

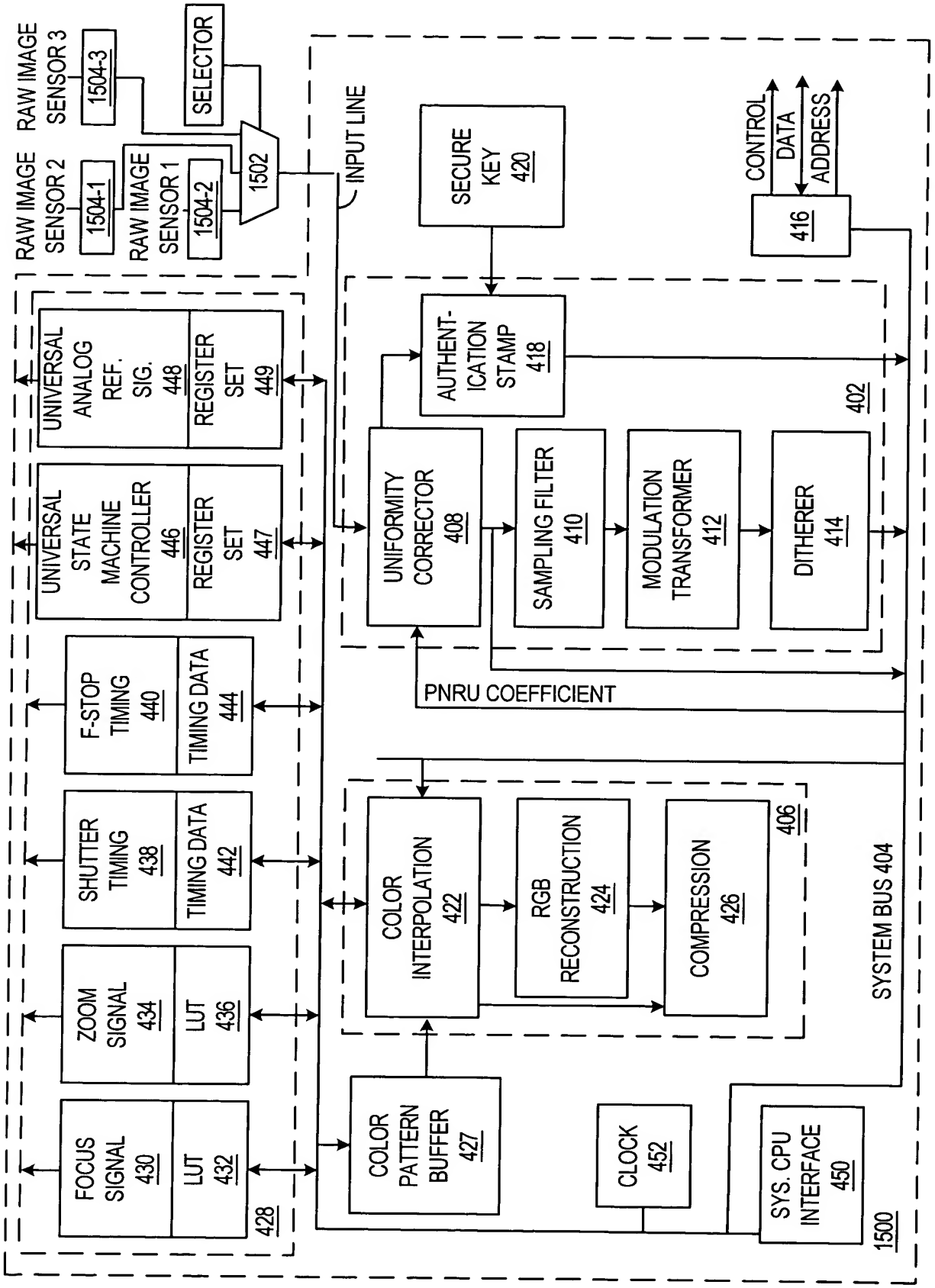
RAW IMAGE SENSOR 3
1504-3
SELECTOR
RAW IMAGE SENSOR 2
1504-1
RAW IMAGE SENSOR 1
1504-2
1502
INPUT LINE
SECURE KEY 420
CONTROL
DATA
ADDRESS
416
UNIVERSAL ANALOG REF. SIG. 448
REGISTER SET 449
AUTHENT-ICATION STAMP 418
UNIVERSAL STATE MACHINE CONTROLLER 446
REGISTER SET 447
UNIFORMITY CORRECTOR 408
SAMPLING FILTER 410
MODULATION TRANSFORMER 412
DITHERER 414
402
F-STOP TIMING 440
TIMING DATA 444
PNRU COEFFICIENT
SHUTTER TIMING 438
TIMING DATA 442
COLOR INTERPOLATION 422
RGB RECONSTRUCTION 424
COMPRESSION 426
406
ZOOM SIGNAL 434
LUT 436
SYSTEM BUS 404
FOCUS SIGNAL 430
LUT 432
428
COLOR PATTERN BUFFER 427
CLOCK 452
SYS. CPU INTERFACE 450
1500

Figure 15